

WHAT IS CLAIMED IS:

1. A parts mounting method wherein a first part is suctioned by a suction head, and positioning is performed so as to mount said first part onto a second part held by a stage, said method comprising the steps of:

preparing a first optical system with an optical axis directed toward said suction head from above, and a second optical system with an optical axis directed generally facing the optical axis of said first optical system, from below said stage;

inserting said suction head between said first optical system and said second optical system so that said first optical system takes an image of a head reference mark provided to said suction head, which can be observed from above, and so that said second optical system takes an image of said first part suctioned to said suction head;

inserting said stage between said first optical system and said second optical system so that said first optical system takes an image of said second part held on said stage, and so that the second optical system takes an image of a stage reference mark provided to said stage, which can be observed from below;

calculating the relative position between said first part and said suction head, and the relative position between said second part and said stage, based upon image information from said first and second optical systems;

detecting said head reference mark and said stage reference mark by said first and second optical systems with said suction head and said stage being positioned at the mounting position, and performing positional correction for at least one of said suction head and stage so that the positions of said first part and said second part satisfy a predetermined relation using the detected positional information and said relative positional information; and

following said positional correction, mounting said first part onto said second part.

2. A parts mounting method according to Claim 1, further comprising the step of inserting a single calibration mark, which can be observed from both above and below, between said first optical system and said second optical system so that images of said calibration mark are taken by said first optical system and said second optical system, whereby an offset of the optical axes of said first optical system and said second optical system is measured.

3. A parts mounting method according to Claim 2, wherein said calibration mark is provided to one of said suction head and said stage.

4. A parts mounting method according to Claim 1, wherein said first optical system and said second optical system are held with a fixed positional relation during said step of taking images of said head reference mark and said first part, said step of taking images of said second part and said stage reference mark, said step of performing positional correction for at least one of said suction head and said stage, and said step of mounting said first part onto said second part.

5. A parts mounting method according to Claim 1, wherein the positional correction step for said suction head and said stage comprises the step of said first and second optical system continuously taking images of said head reference mark and said stage reference mark while heating one or both of said suction head and said stage for bonding, while correction is performed regarding the relative position between said suction head and said stage based upon said relative positional information so that the positions of said first part and said second part have a predetermined relation.

6. A parts mounting apparatus for positioning and mounting a first part and a second part, said apparatus comprising:

a suction head, having a head reference mark which can be observed from above, for suctioning said first part at a lower end portion of said suction head;

a stage, having a stage reference mark which can be observed from below, for holding a second part at an upper end portion of said stage;

a driving mechanism for relatively moving said suction head and said stage in X, Y, Z, and θ directions;

a first optical system for taking images of said second part held by the stage, and said head reference mark, from above said suction head;

a second optical system, disposed so as to generally face said first optical system with the optical axis thereof aligned with the optical axis of said first optical system, for taking images of said first part suctioned to said suction head, and said stage reference mark, from below said stage;

a computation device for calculating the relative position between said first part and said suction head, and the relative position between said second part and said stage, based upon image information from said first and second optical systems; and

a control device for performing positional correction for said suction head and said stage so that the positions of said first part and said second part satisfy a predetermined relation based upon said positional information and said relative positional information from said first and second optical systems detecting said head reference mark, and stage reference mark with said suction head and stage being positioned at the mounting position.

7. A parts mounting apparatus according to Claim 6, further comprising a positioning arrangement for continuously holding said first optical system and said second optical system in a fixed relation, at least when said images are taken and at least until said suction head and stage are at said mounting position.

8. A parts mounting apparatus according to Claim 6, wherein

at least one of said suction head and said stage includes a part-suction opening; a hollow portion provided behind a back side of said part-suction opening and communicating with said part-suction opening; a transparent member, which closes the end opposite said part-suction opening of said hollow portion, whereby the

part-suction opening can be observed from the back side through said transparent member; and an air suction path connected to said hollow portion, and

wherein at least one of said first optical system and said second optical system detects said part-suction opening as said head reference mark or said stage reference mark through said transparent member.

9. A parts mounting apparatus according to Claim 8, wherein a heater is fixed near said part-suction opening.

10. A parts mounting apparatus according to Claim 8, wherein the back side of said suction head or said stage is mounted to said driving mechanism by a bracket including a hollow portion, whereby said first or second optical system can be inserted for taking images of said part-suction opening through said transparent member.